



# FloraGREIF

# A Virtual Flora of Mongolia

## Greifswald's Digital Information System on the Flora of Mongolia

Institute of Geography and Geology, Institute of Botany and Landscape Ecology  
& Computer Centre, University of Greifswald

CNI Spring 2010 Membership Meeting, Baltimore







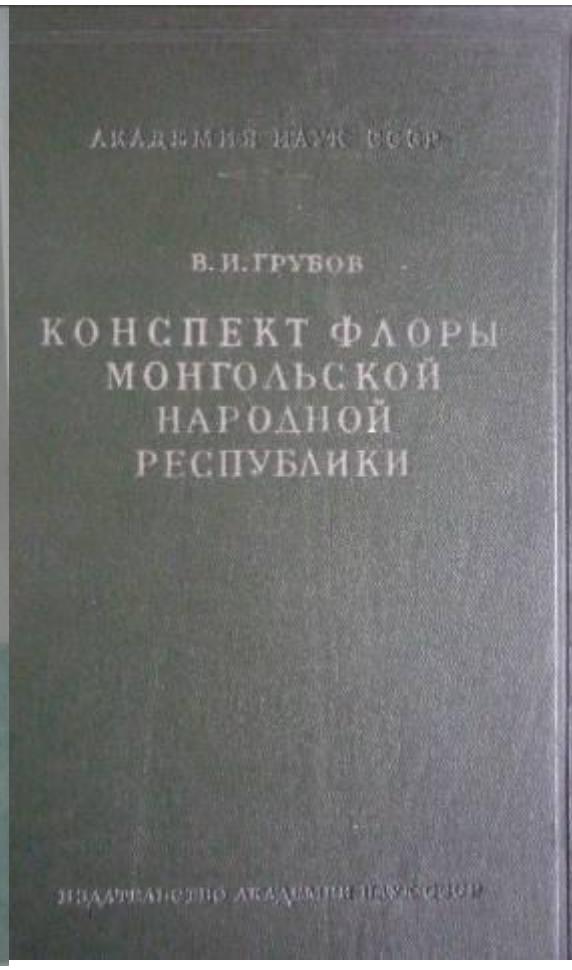
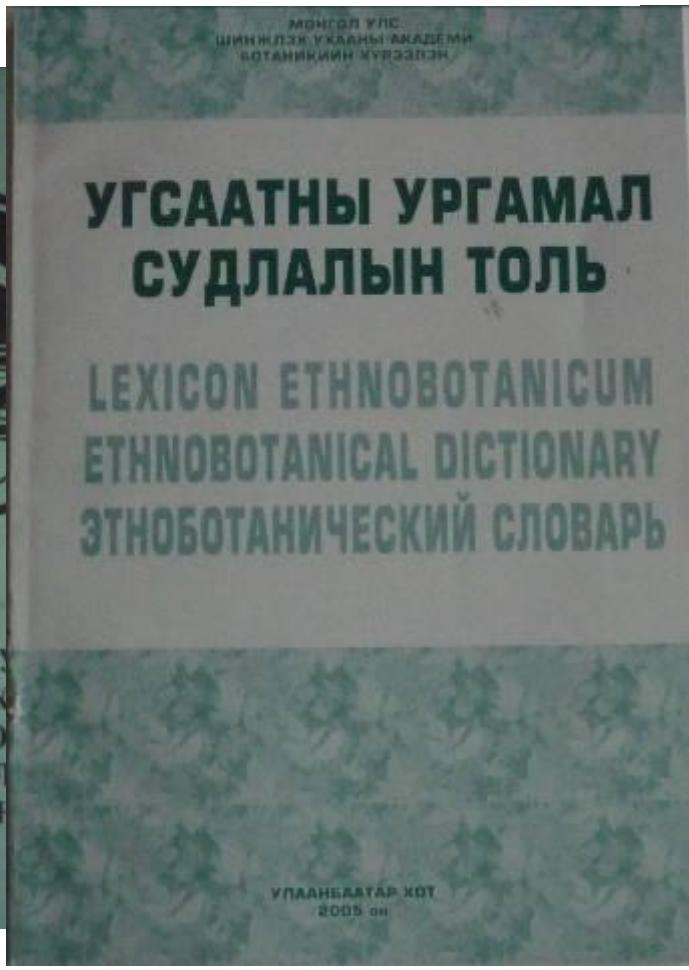








# Background



# Background



- Long term research experience in Mongolia since the 1970s in Greifswald University and other institutions in (former East) Germany
- Large herbaria collections from Mongolia in Germany
- Russian literature & language skills available

# Objectives

- **Main target groups**

Ecologists, specialists in plant taxonomy, students of biological sciences, amateur botanists

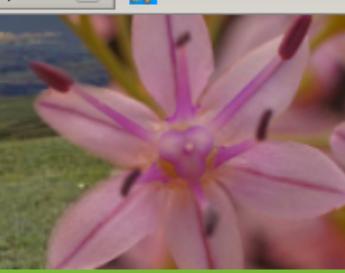
- **Main targets**

Fast information access, plant determination, supporting taxonomic revisions

- **How?**

Internet database, digital images, WebGIS application

## Virtual Flora of Mongolia



Home      Search Plants      WebGIS      Technical Terms      Literature      Further Information

Get an Overview

Targeted Search



Taxon data



Records



Herbar scans



Species photos



Habitat photos



FloraGREIF project  
is in progress.  
Let us know what  
we can do better.

52 taxa found for Alliaceae 1 - 10

Scientific Name

Synonym

Record Data

Image Data

*Allium altaicum* Pall.

Alliaceae

*A. platyspathum* ssp.  
*amblyophyllum* Kar. et  
Kir.  
acc. to: Friesen 1995,  
2001; Gubanov 1996  
*A. platyspathum* auct.  
non Schrenk: Egorova  
2003: 62, p.p.  
acc. to: Friesen 1995

*Allium amblyophyllum* Kar. et Kir.

Alliaceae

*Allium amphibolum* Ledeb.

Alliaceae

3 records



*Allium anisopodium* Ledeb.

Alliaceae

5 records



*Allium austrosibiricum* N. Friesen

Alliaceae

*Allium bidentatum* Fisch. ex  
Prokh.

Alliaceae

*A. senescens* auct. non  
L.: Egorova  
1977/2003, Grubov  
1982/2001  
acc. to: Friesen 1995  
*A. spirale* Willdenow  
acc. to: Xu Jiemei &  
Kamelin 2000

4 records



*A. omiostema* Airy  
Shaw  
acc. to: Friesen 1995

4 records



*A. schrenkii* auct. non

## Get an Overview

## Targeted Search

 [Taxon data](#) [Records](#) [Herbar scans](#) [Species photos](#)

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Family: Alliaceae

For Mongolia the key of N. Friesen (1995) and for former Soviet Central Asia the use of the "Flora of Siberia / 4 / Araceae - Orchidaceae" (1987/2001) is highly recommended.



Scientific name: ***Allium malyschevii* N. Friesen**

Source: Gubanov 1996, not in Grubov 1982/2001

Synonym: A. amphibolus auct. non Ledeb.: Grubov 1982/2001: 65/127 p.p.  
(acc. to Friesen 1995)

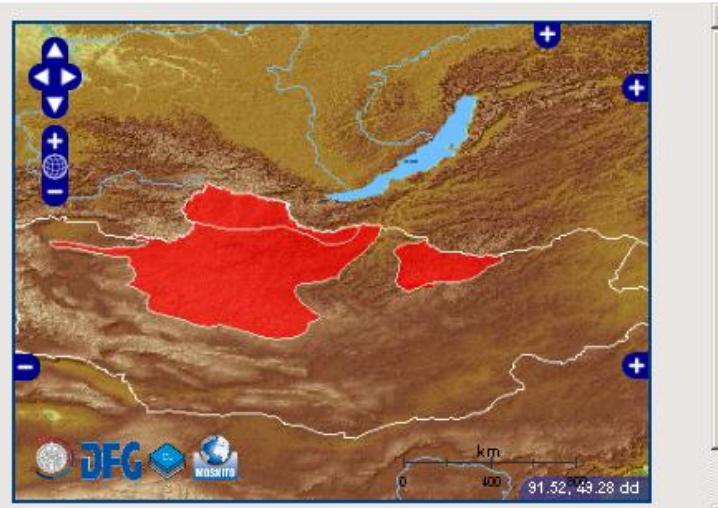
Description: Bulbs several on distinct rhizome, cylindrical- conical, 5-9 cm long, with grayish-brown reticulate-fibrous tunic; scape 15-30 cm tall, covered at very base with erubescence leave sheaths; 2 leaves, linear, flat, narrowed towards base and tip, falcate, obtuse, slightly shorter than or as long as scape; umbel globose, rarely subhemispherical, compact, capitate; pedicels slightly longer than perianth; perianth lobes bright purple; filaments 1.5 times longer than perianth lobes, inner filaments with 2 acute, often bifid teeth.  
(acc. to Friesen 1987/2001)

Confuse with: Allium amphibolus Ledeb., A. pumilum Vved.

Comments: A. malyshevii: scape covered at very base with erubescence leave sheaths (difficult to separate mentioned species by means of this property, cf. herbar scans); inner filaments with 1, often bifurcate tooth at each side. A. amphibolus & A. pumilum: scape covered 1/3 - 1/2 with leave sheaths; inner filaments with 1 short tooth at each side or undentate.

Distribution: Khubsugul, Khentei, Khangai (acc. to Gubanov 1996)

[open map in a new window!](#)



Habitat:

In alpine meadows, in grassy stony slopes, in alpine belts (Friesen 1995).

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Family

Collector

[Taxon](#)[Record](#)

Distributed:

 cedarpine cedarpine-larch clayey clayey-debris clearings cliffs coastal coasts coniferous creek crevices crops damp

Habitat:

Status:

Red list:

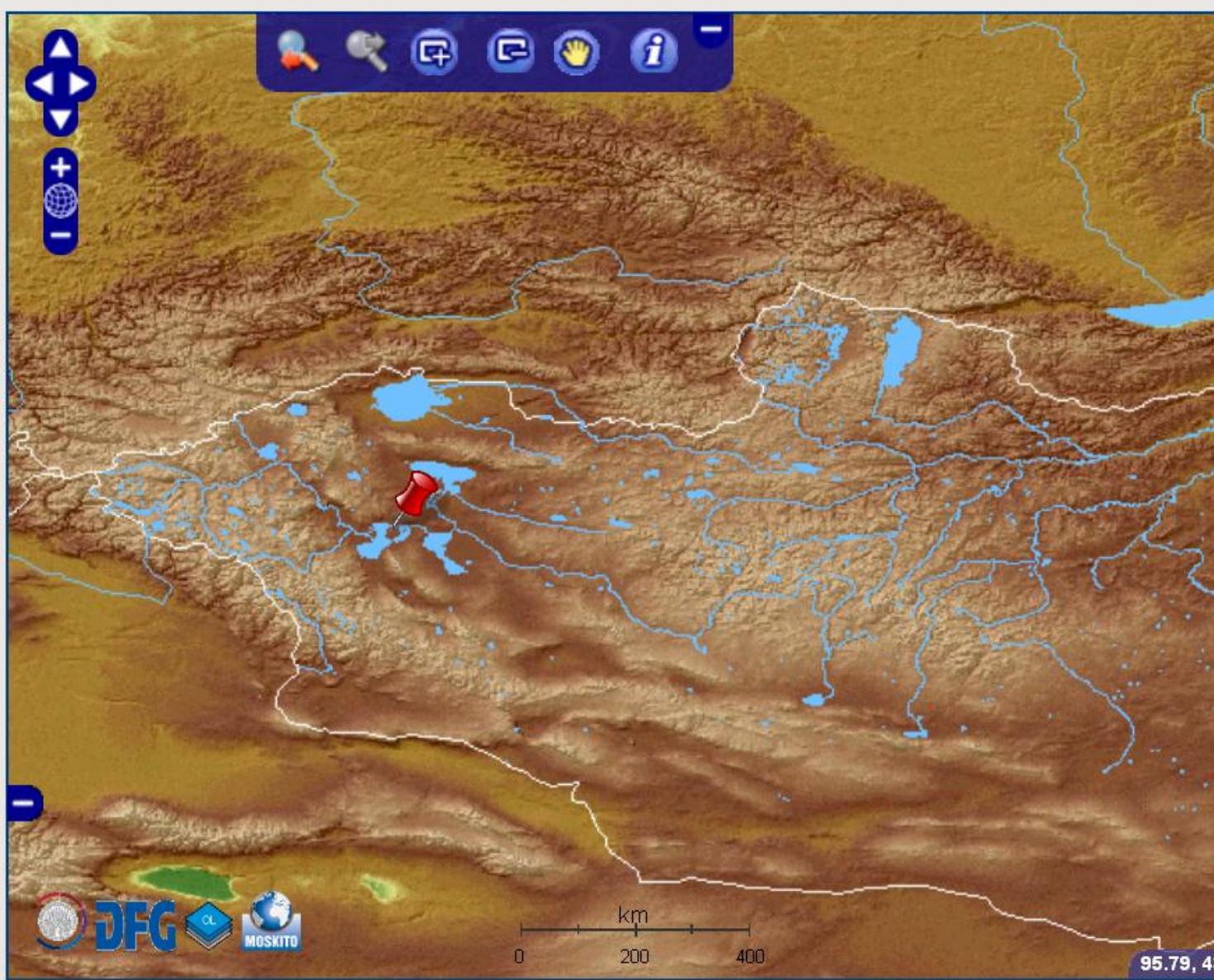
Growth form:

[Overview](#)[Literature](#)[Further Information](#)

Coordinates:

Geogr. Coord. 92.5258 (lon) 48.2742 (lat) decimal

[hide map](#)



[Click inside map for more information](#)



**Home**    **Search Plants**    **WebGIS**    **Technical Terms**    **Literature**    **Further Information**

### Get an Overview

### Targeted Search

Taxon data

Records

Herbar scans

Species photos

Habitat photos

1 taxa found for alliu mong

#### Scientific Name

*Allium mongolicum* Turcz. ex  
Regel  
Alliaceae

#### Synonym

#### Record Data

20 records

#### Image Data



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# Virtual Flora of Mongolia

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12 records for Polygonaceae *Calligonum mongolicum*

1 - 10

[Calligonum spec.](#) [Polygonaceae spec.](#)**Identified as****Editor****Coll. no****Date****Images*****Calligonum mongolicum***Leg: Anne Zemmrich  
Teste: Rolf Wisskirchen

AZ 030

09.08.2003

***Calligonum mongolicum***Leg: K.-F. Günther et M.  
Schnittler  
Teste: Zemmrich, Anne

27809

29.08.2007

***Calligonum mongolicum***Leg: C. Davazhamc & P.  
Hanelt  
Teste: Zemmrich, Anne

1070

18.06.1962

***Calligonum mongolicum***Leg: S. Danert, C.  
Davazhamc, P. Hanelt & Ch.  
Sanchir  
Teste: Zemmrich, Anne

3697

11.07.1964

***Calligonum mongolicum***Leg: Exkursion, S. Rilke  
Teste: Zemmrich, Anne

249a

14.08.2003

***Calligonum mongolicum***Leg: Anne Zemmrich  
Teste: Rolf Wisskirchen

AZ 812

09.08.2003

***Calligonum mongolicum***Leg: Karsten Wesche  
Teste: Zemmrich, Anne2004 - 24  
572

8.07.2004

***Calligonum mongolicum***Leg: Anne Zemmrich  
Teste: Rolf Wisskirchen

32/2005

14.09.2005

***Calligonum mongolicum***Phot: M. Schnittler  
Teste: Zemmrich, Anne

photo

11.08.2003



# RECORD images: Herbar Scans



+- ← ↑ ↓ → ⌂ ▲

A set of control icons typically used for navigating through digital image pages, including symbols for zooming in and out, moving left and right, and navigating between pages.

**RECORD images:    habitats,    habitus,    details**



Sazes	Habitats with constant regime of moistening by groundwaters in dry regions of Central Asia
Schistose (schistose slopes)	From schist, a group of medium-grade metamorphic rocks, a kind of slate
Sheep's-fescue	<i>Festuca ovina</i> L. (and related microspecies)
Solonchaks	Alkaline soil with saline crust on its surface in a semi-/arid climate
Solonetz	Alkaline clayey sodium soils with swelling and shrinking dynamics in a semi-/arid climate
Sondoks	Saline soils
Spur (tops of spurs)	Foothills, rock overhang
Tailing (upper parts of tailings)	Originally means coarse sediment, partly applied for pediment, similar to 'bel'
Tailing, proluvial	Coarse to fine sediment accumulated at the foot of a slope building a deltaic lobe, created by weathering of the rocks
Takyr	Soil or surface of clayey soils forming a dry crust with shrinking fissures on the surface, often with cyanobacteria layers when wet
Takyred (takyred depressions, lowlands)	Refers to the dried crust with shrinking fissures at its surface, often heavily saline
Talus	Surface of broken rocks found on mountain slopes and at the base of cliffs (pieces usually of larger size than scree) (Pyak et al. 2008)

### Technical Terms

### Transcription

### Guideline

### Geography

- [Administrative Division of Mongolia](#)

(Data Sources: Tserennyam 2007a, b)

All geographical names are transcribed from the Mongolian original spelling acc. to Encyclopaedia Britannica, Inc. (1997) and UNGEGN: United Nations Group of Experts on Geographical Names (2003).

- [Mongolian Provinces and Province Capitals](#)

(Data Sources: Tserennyam 2007a, b)

All geographical names are transcribed from the Mongolian original spelling acc. to Encyclopaedia Britannica, Inc. (1997) and UNGEGN: United Nations Group of Experts on Geographical Names 2003).

- [Main Geographical Region of Mongolia based on Mongolia's National Atlas \(Akademiya Nauk SSSR & Akademiya Nauk MNR 1990\).](#)

They are used for locality data of plant records within the FloraGREIF database.

All geographical names are transcribed from the Mongolian original spelling acc. to Encyclopaedia Britannica, Inc. (1997) and UNGEGN: United Nations Group of Experts on Geographical Names (2003) except for internationally accepted names.

- [Geobotanical Region of Mongolia - Basis of Distribution Data \(acc. to Grubov 1955\)](#)

All geographical names are transcribed from the Mongolian original spelling acc. to Encyclopaedia Britannica, Inc. (1997) and UNGEGN: United Nations Group of Experts on Geographical Names (2003).



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we can do better.

- Cited references
- Further references according to keywords (taxonomy, botany, ecology, biogeography etc)

# Peculiarities

- More than digitization of plant collections
- Botanical, geographical, and further data on Mongolia's flora at two data levels
- Image data at various spatial scale
- Data export possible for authorized users (standard list format e.g. txt, csv, xml, xls)
- WebGIS

# Part 2: IT and WebGIS

1. IT components, Standards
2. WebGIS in FloraGREIF

# Starting point

## CMS GREIF, first implementation as GeoGREIF

- Project „Digital Archive for Swedish Land Survey of Pomerania 1692 – 1709“, funded by DFG 2004 –2006
- <http://greif.uni-greifswald.de/geogreif>

## Specifications:

- Apache Web Server
- MySQL (option: Oracle)
- Data access via PHP
- Html templates

# GeoGREIF



The screenshot shows the GeoGREIF website interface. At the top, there is a banner with a historical map of Greifswald and the text "GeoGREIF Geographische Sammlungen". Below the banner, a title reads: "Greif - GeoGREIF - Historische Kartenwerke mit thematischem Bezug - **Matrikelkarten der Schwedischen Landesaufnahme von Vorpommern 1692 - 1709** register maps of a land survey in swedish pommerania 1692 - 1709". The main content area has a sidebar on the left with links like "Willkommen Welcome", "Karten suchen - Ortsnamenliste retrieve maps - listed by names", "Legende der Kartensymbole legend", "Übersichtskarte overview map", "Findbuch des Landesarchivs Greifswald Archives map finding aids", "Text- und Beschreibungsbände im Landesarchiv Greifswald listing of all documents available online", "Matrikelkarten im Landesarchiv Greifswald listing of all matrikel maps available online", and "Literatur literature". The central area displays search results for "Greifswald" with a box containing a map of Greifswald and text about viewing it. To the right, there is a box with a summary of the collection and another box with detailed metadata for the map.

In diesem Bereich befinden sich 1585 Karten und 72 Dokumente zu 1581 Orten.  
This library contains 1585 maps and 72 documents referring to 1581 locations.

Die hier verzeichneten Matrikelkarten befinden sich überwiegend im Besitz des **Landesarchivs Greifswald**, ein Teilbestand befindet sich im Besitz des **Instituts für Geographie und Geologie der Universität Greifswald**.  
The main part of the matrikel maps listed here can be found at the **Landesarchiv Greifswald**, a minor part can be found at the **Institut für Geographie und Geologie der Universität Greifswald**.

# GeoGREIF



Anne Zemmrich & Reinhard Zoelitz

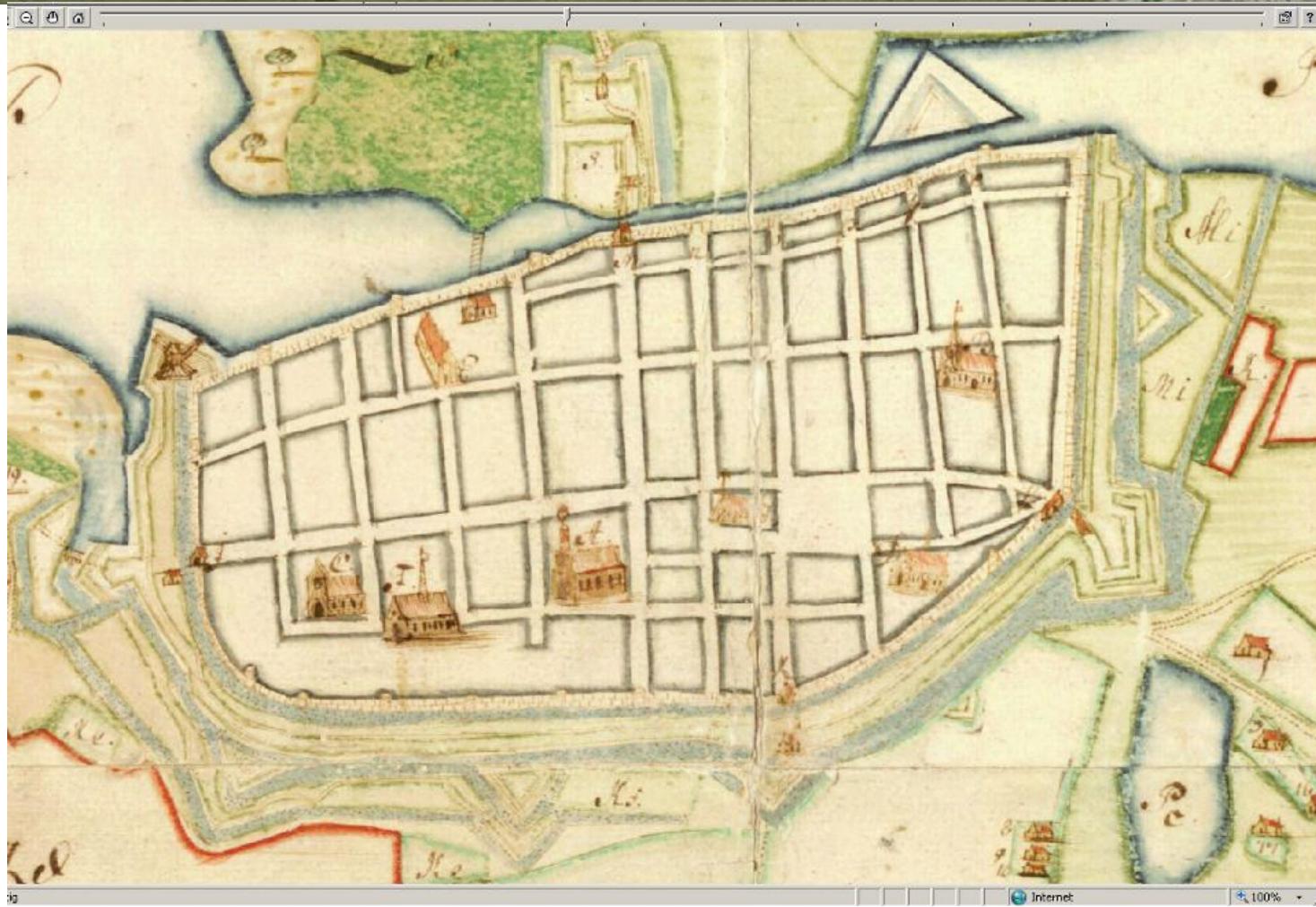
Institute of Botany and Landscape Ecology & Institute of Geography and Geology  
University of Greifswald, Germany

ERNST MORITZ ARNDT  
UNIVERSITÄT GREIFSWALD

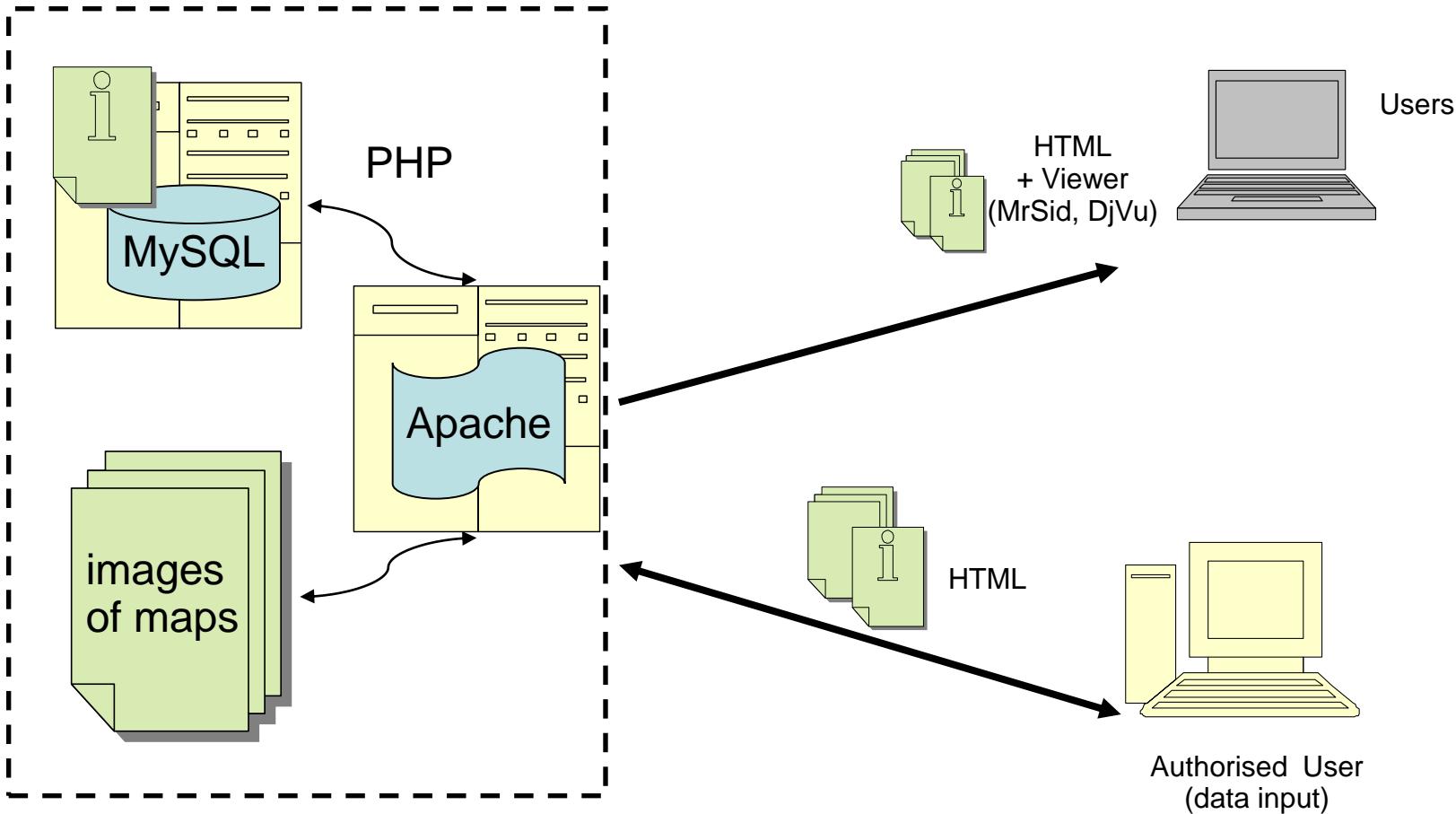


Weissen  
lockt.  
Seit 1456

# GeoGREIF



# CMS GREIF /GeoGREIF



# Implementation of FloraGREIF

Extend CMS GREIF-GeoGREIF to FloraGREIF:

Add subject-specific components: taxon, record,  
image data

Add Search engine and choose an adequate viewer,  
file size of approx. 200 MB (ZOOMIFY)

Add WebGIS functionality

# Components of FloraGREIF

**Web Mapping Service**

**Moskito-GIS**      **(OGC conform)**

**Web Map Client**

**OpenLayers**      **(Open Source / modified)**

**Content Management System**

**Wordpress**      **(Open Source)**

**Database**

**MySQL**      **(Open Source)**

**Web-Processing**

**PHP**      **(Open Source)**

**Web-Server**

**Apache**      **(Open Source)**

# Standards for WebGIS: OGC

## OGC:

Open Geospatial Consortium (OGC) is an international industry consortium of companies, government agencies and universities participating in a consensus process to develop publicly available geoprocessing specifications

### The most important OGC specifications

OGC Reference Model - a complete set of reference models.

WMS - Web Map Service

WFS - Web Feature Service

WCS - Web Coverage Service

CAT - Web Catalog Service

SFS - Simple Features - SQL

GML - Geography Markup Language



# ... and ISO / TC211

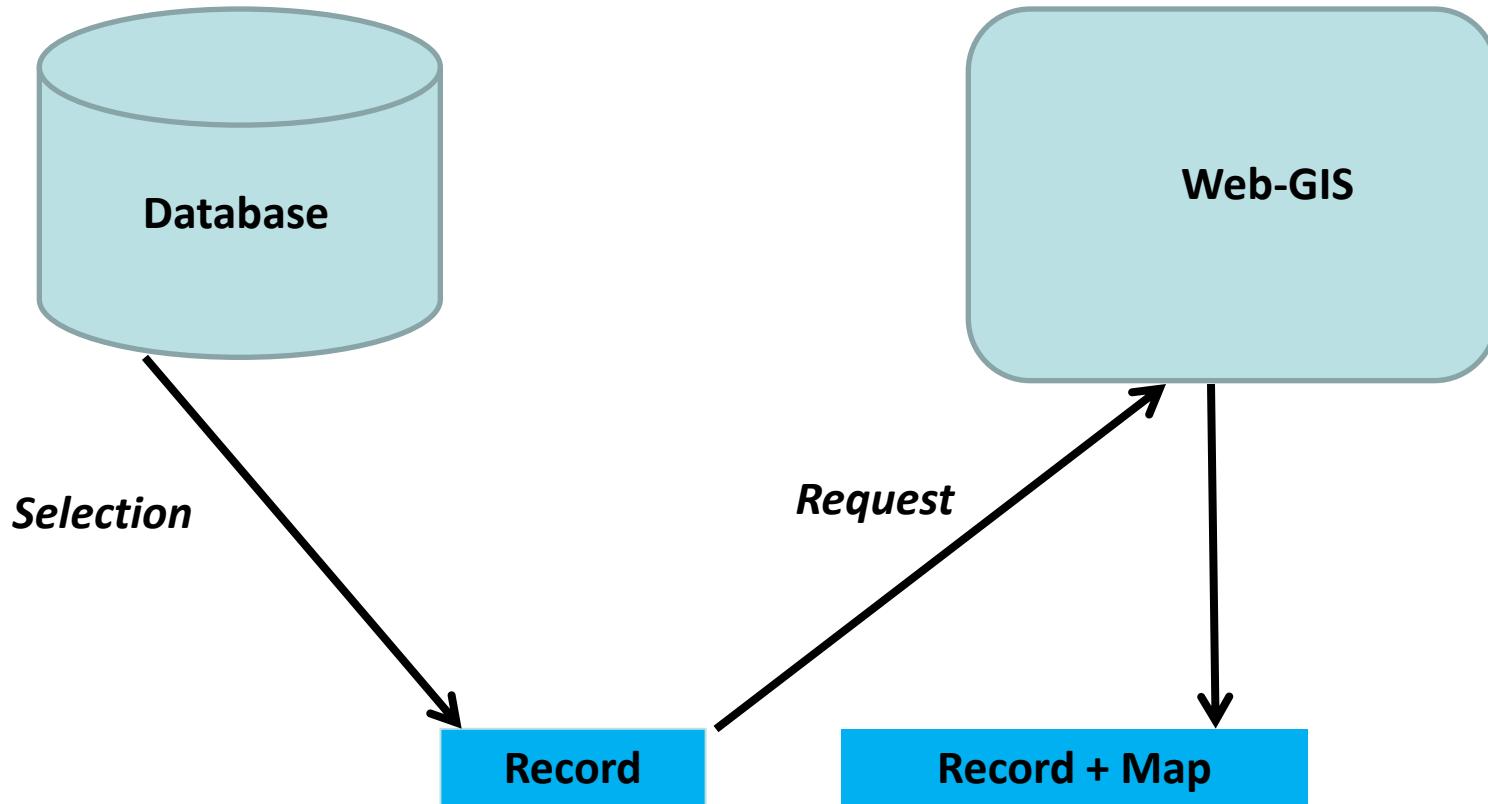
## ISO/TC 211 Geographic Information/Geomatics

Standardization in the field of digital geographic information.

These standards may specify, for geographic information, methods, tools and services for data management (including definition and description), acquiring, processing, analyzing, accessing, presenting and transferring such data in digital/electronic form between different users, systems and locations.

<http://www.isotc211.org/>

# Joining Web and GIS



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Polygonaceae    *Aconogonon alpinum* (All.) Schur

Collected by: Anne Zemmrich, 18.07.2002, Coll.No. AZ 636  
 Determined by: Oyuunchimeg Damdinsürengiyn, Summer 2002  
 Confirmed by: Anne Zemmrich, Feb 04  
 Flowering status: flowering plant with seeds  
 Remarks written on herbar label: companion of relevé 20-25  
 Herbarium: GFW Acc. No.: 38673  
 herbar scan

**Images**

leaf and stem  
photo by: FloraGREIF:  
D.Pietzsch



ochrea with adpressed  
bristles  
photo by: FloraGREIF:  
D.Pietzsch

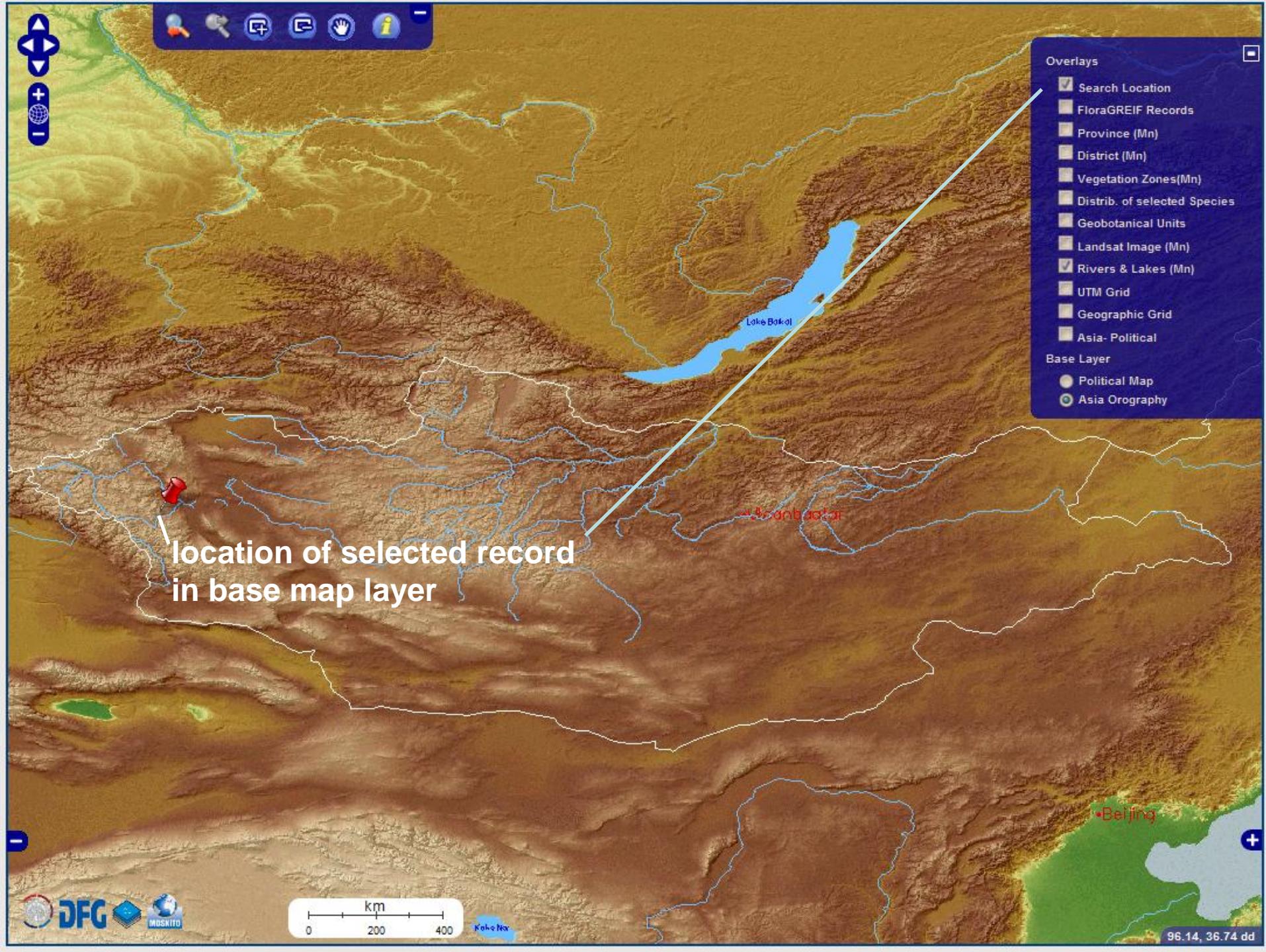


ochrea with adpressed  
bristles  
photo by: FloraGREIF:  
D.Pietzsch

Country: Mongolia  
 Province: Khovd  
 District: Khovd  
 Geogr. Region: Mongolian Altai  
 Locality: 12 km ssw of sum centre Dund-Us, westerly beside of road  
 between sum centre Dund-Us and centre of former Brigade  
 No. 3  
 Coordinates: Geo. Coo. 91.328279 (lon) 48.027374 (lat) decimal WGS 84  
[show map](#)  
 GPS number: around 50 and 51 (50)  
 Altitude: 2342 m asl  
 Habitat: alpine steppe, companion of Aster alpinus-Koeleria cristata-alpine mountain steppe community accord. to Zemmrich  
 (2007): Dissertation, Institute of Botany and Landscape  
 Ecology, University of Greifswald

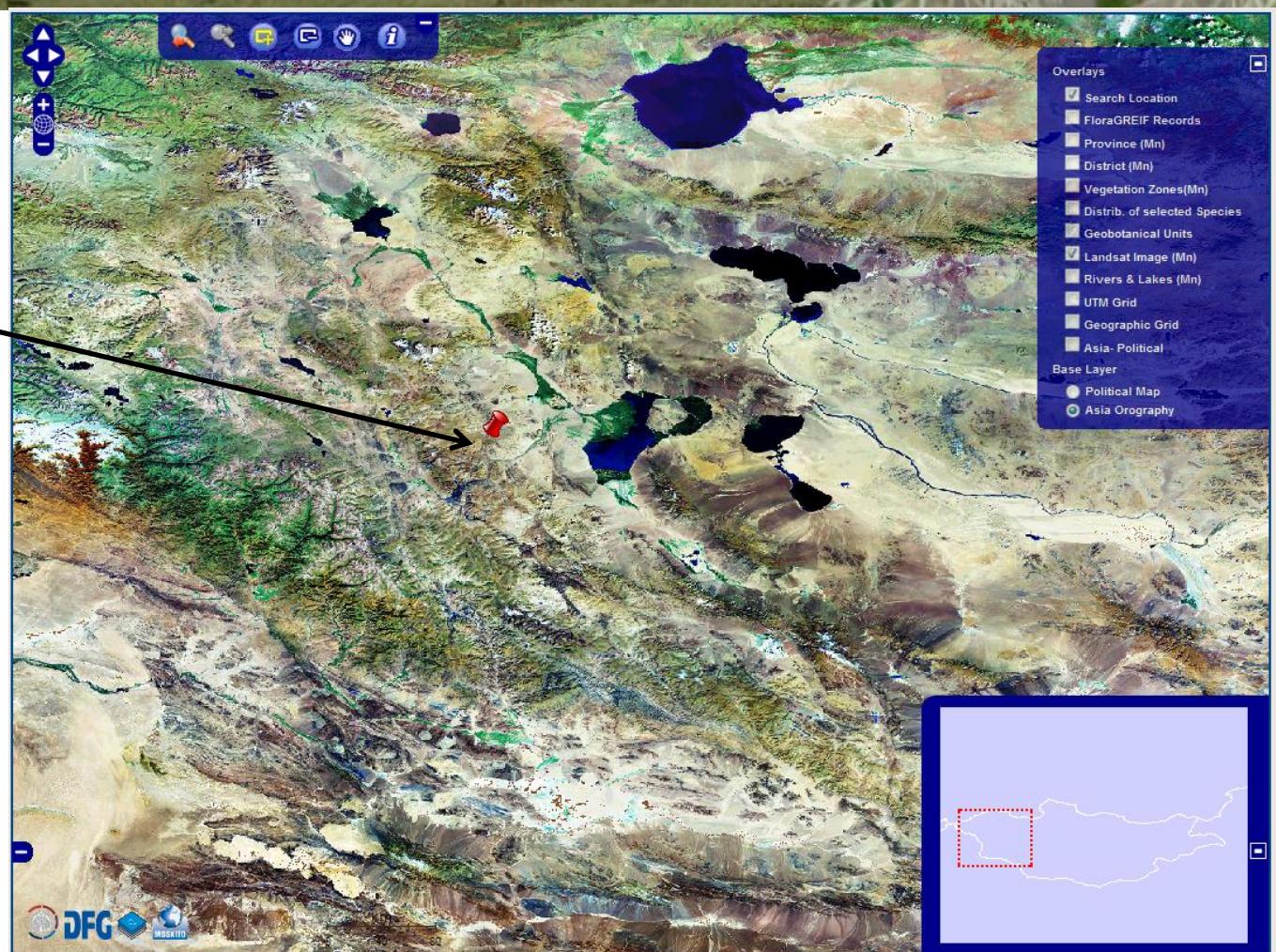
**Selection:**  
***Aconogonon alpinum***

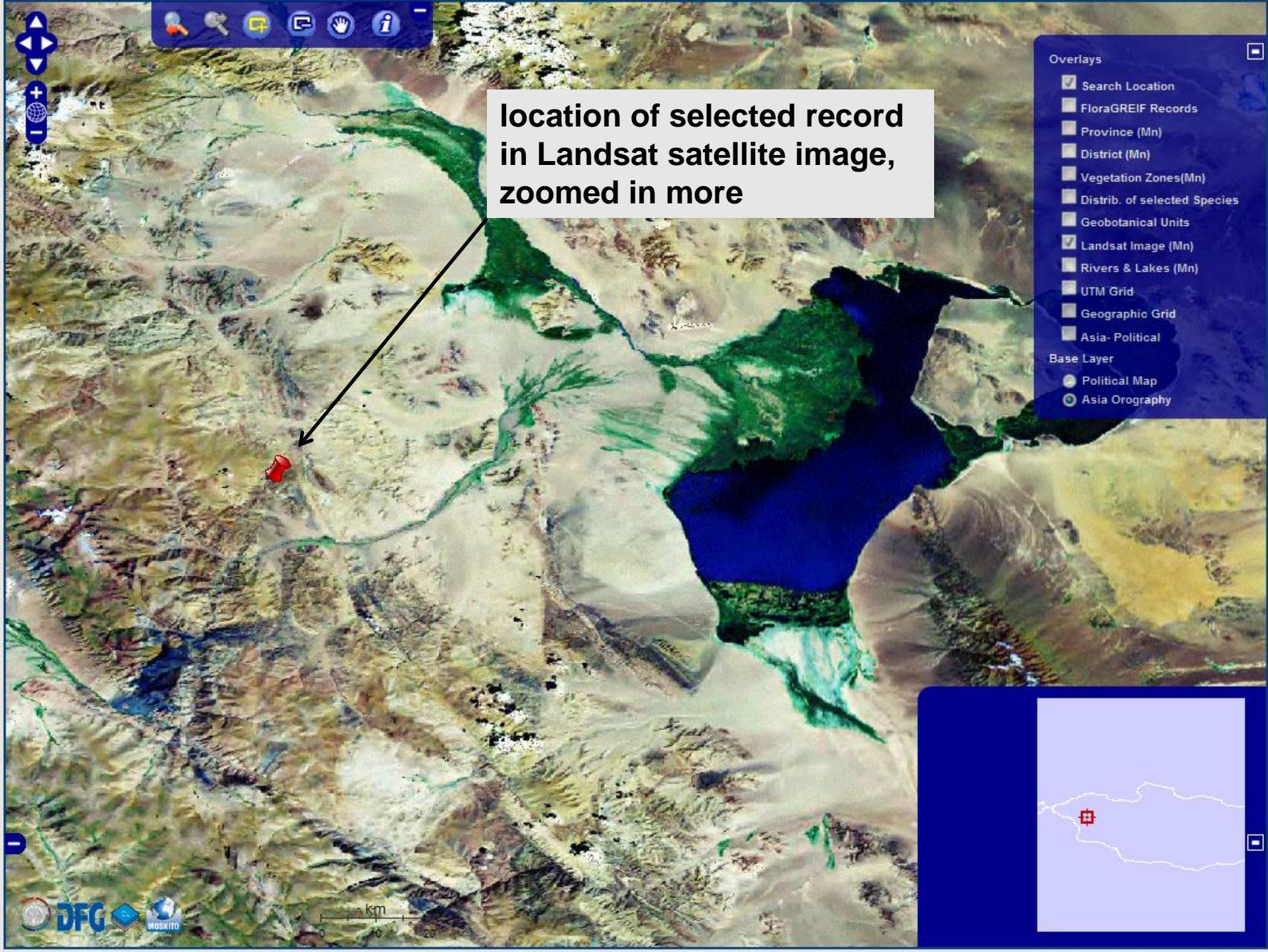
If coordinates available:  
 You may want to see a **map**

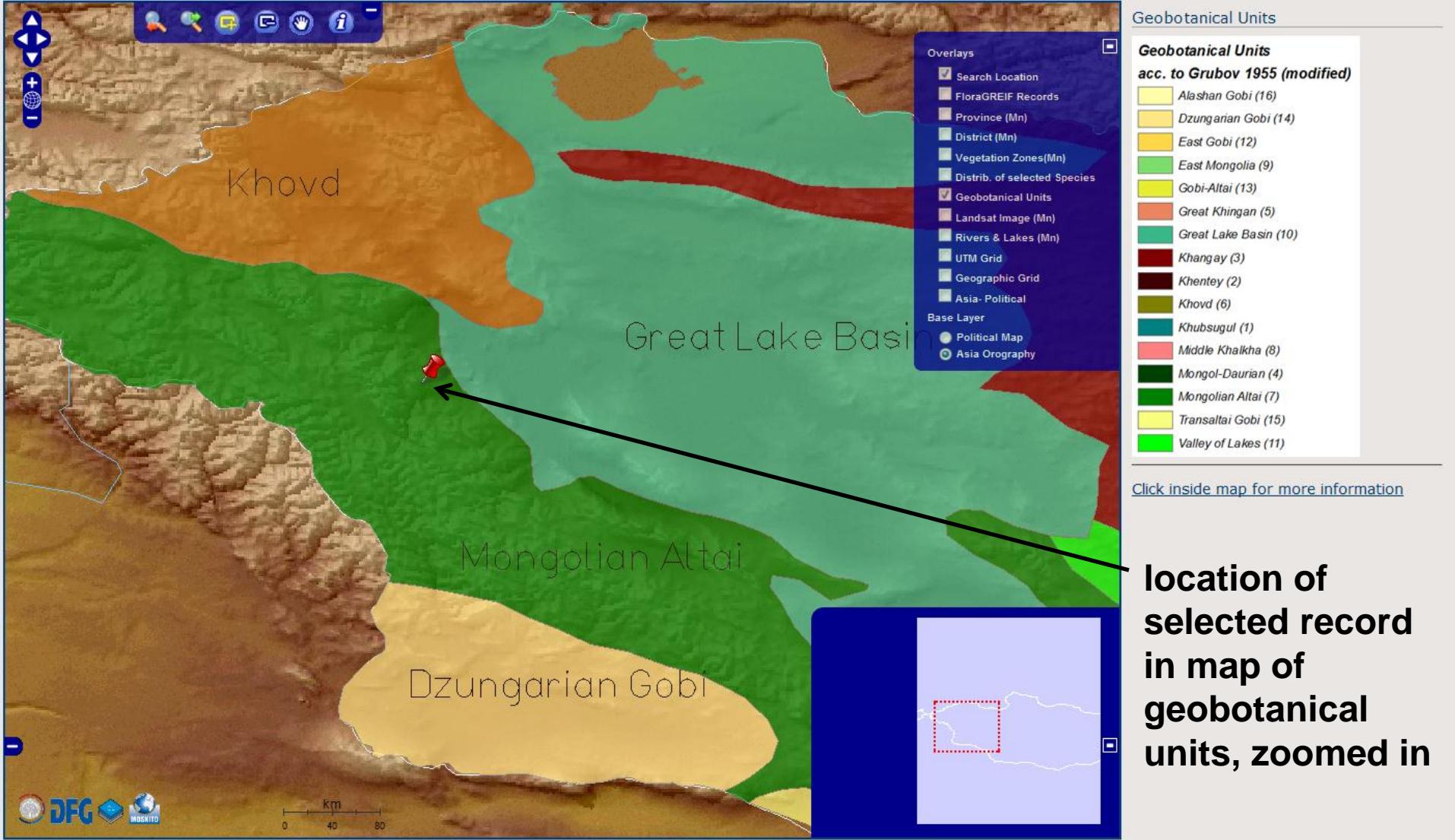


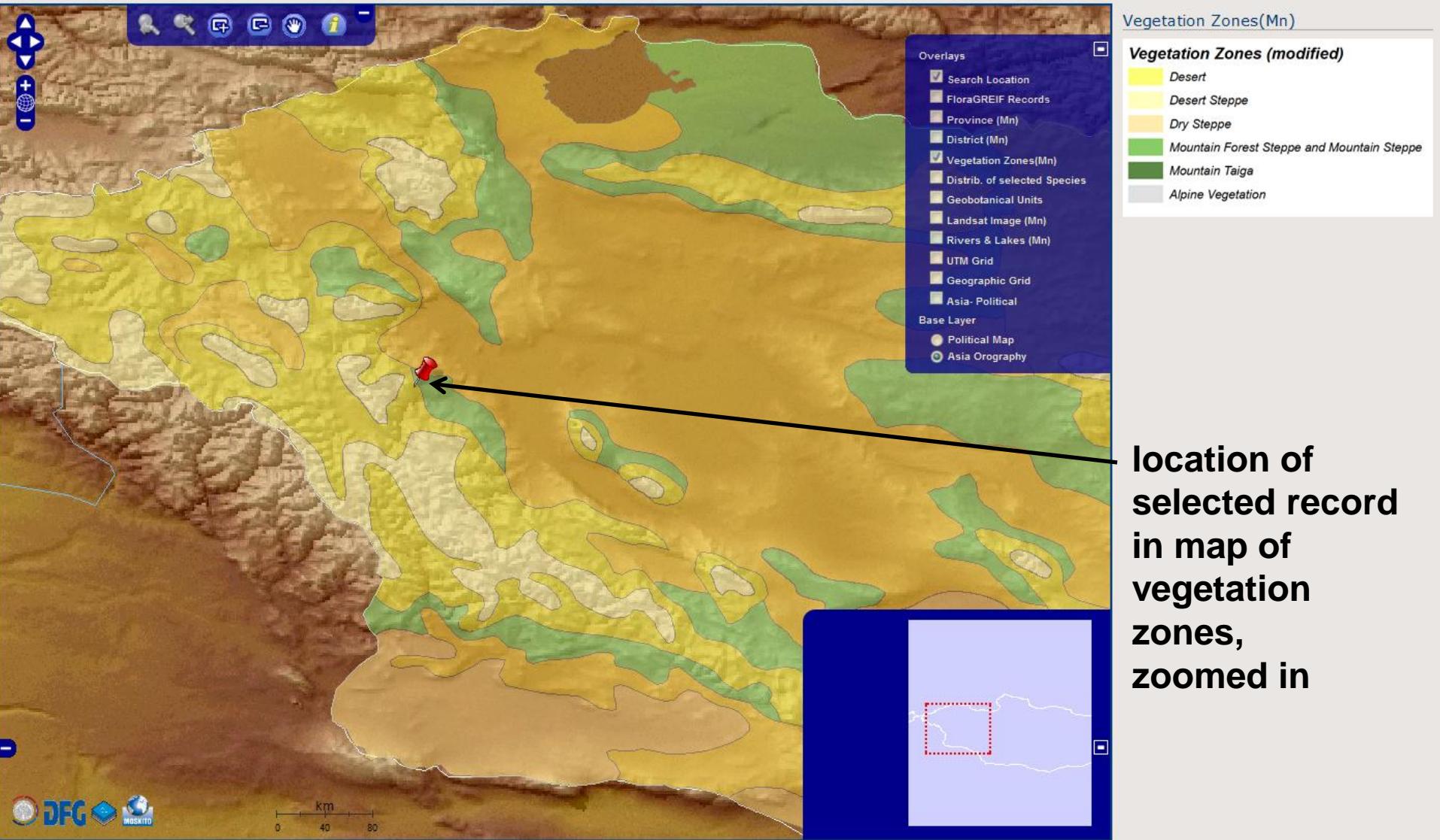
# Satellite image

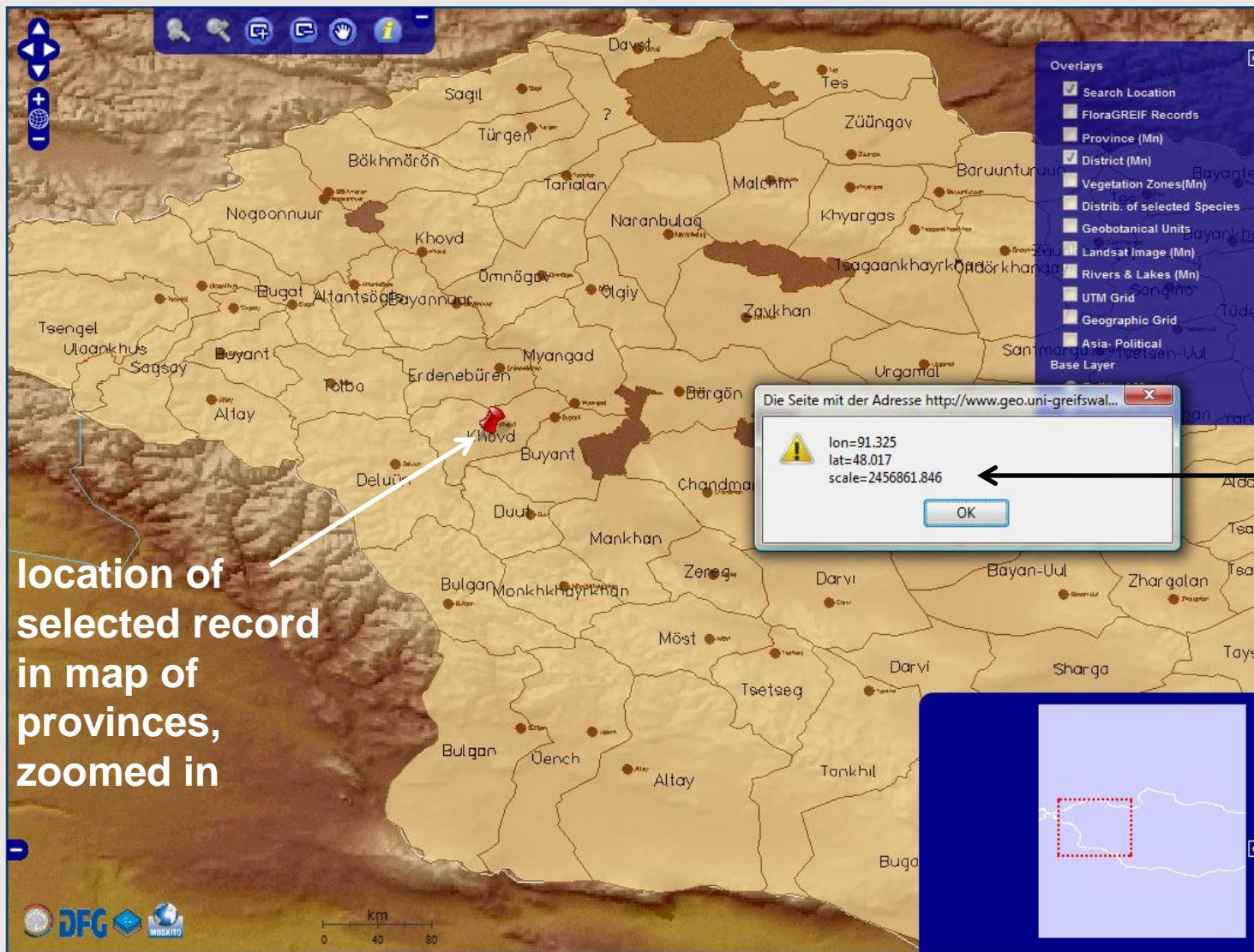
location of selected record in Landsat satellite image, zoomed in





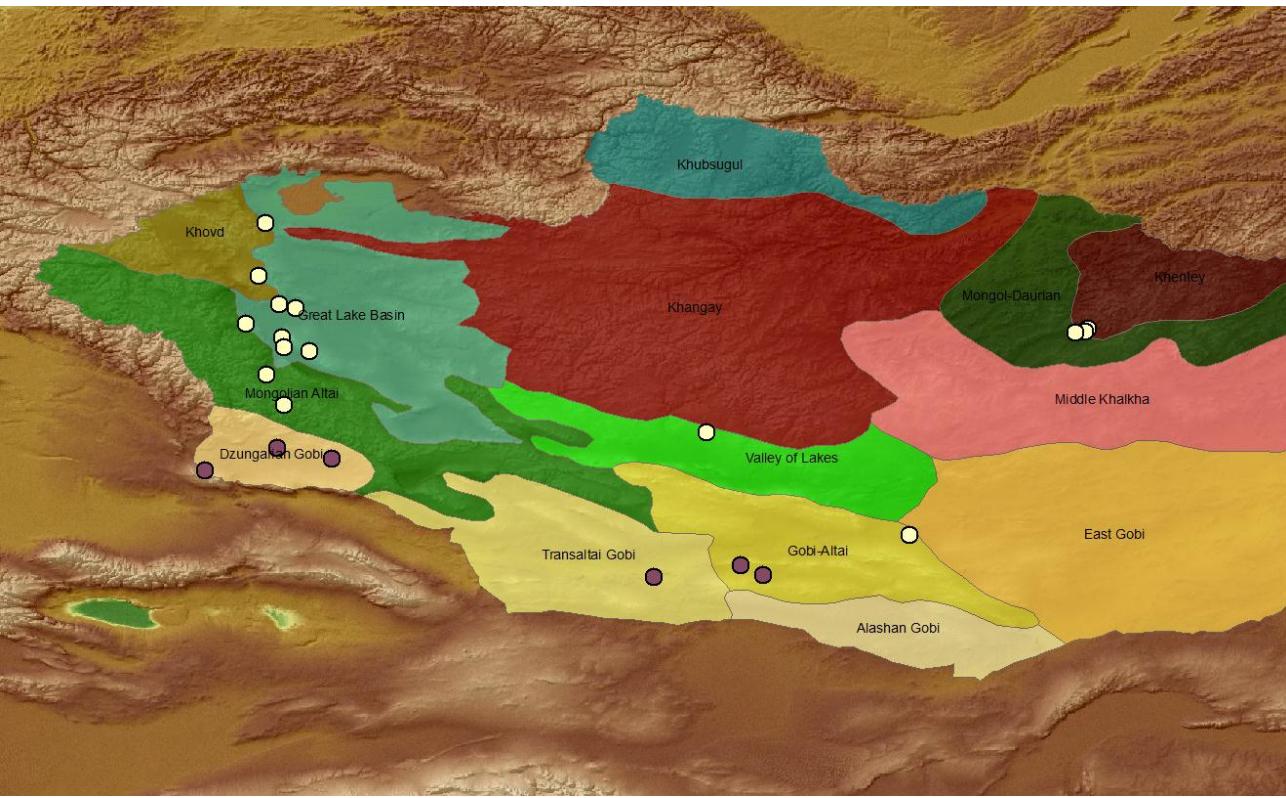






Show coordinates of location where clicked, use it for data input when needed

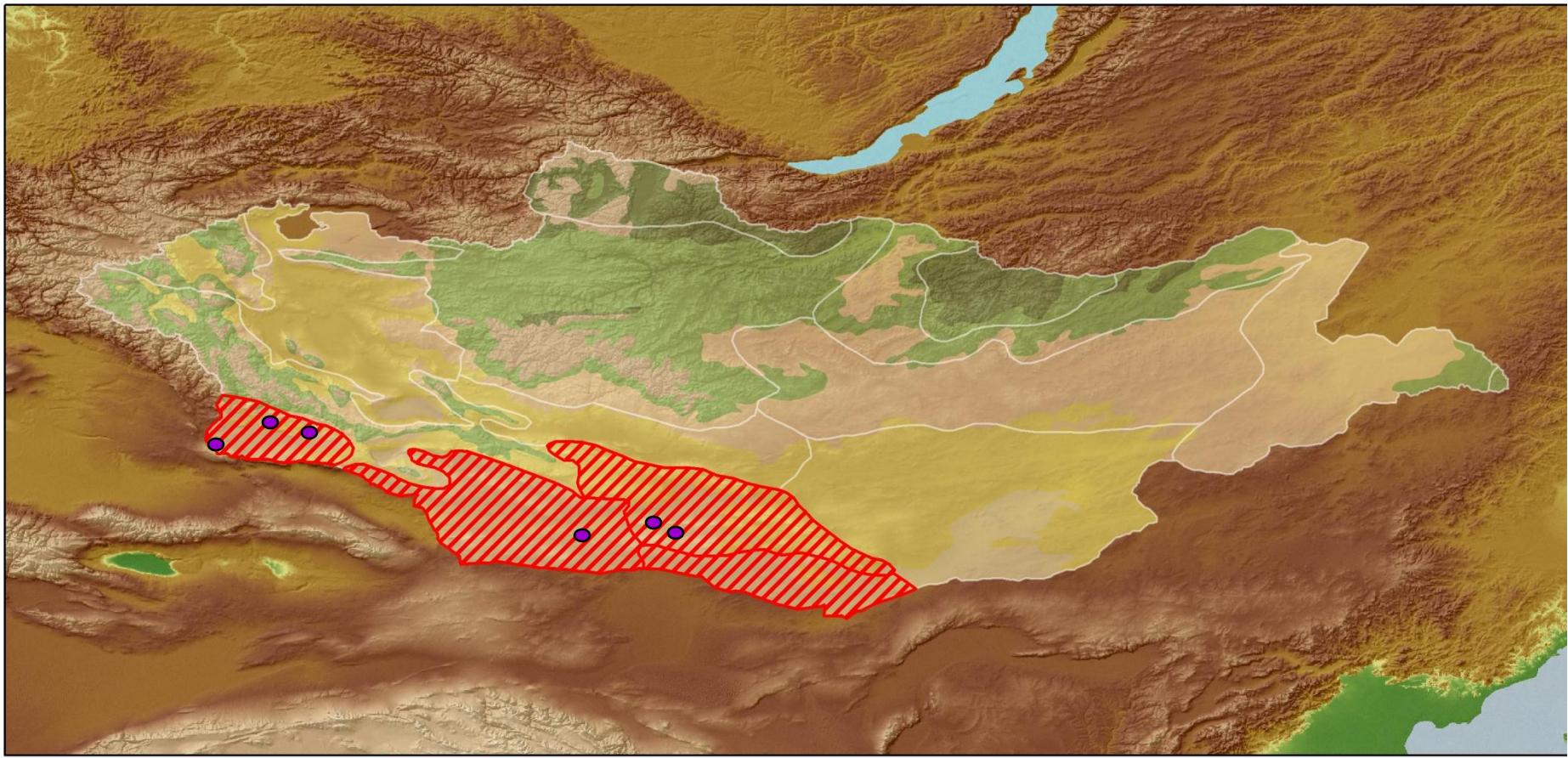
# Near future, perspectives



Select (in database)  
and show (in WebGIS)  
e.g. all records of  
*Salsola arbuscula*  
(violet) and other  
*Salsola* (yellow)

# Near future, perspectives

Distribution of *Salsola arbuscula*



# Near future, perspectives

Show locations of records of selected species in maps

More map layers (geographical regions, topographic maps 1:500.000)

More point data layers (e.g. habitat photo sites to choose from the map)

Gazetteer- Service (toponyms for geographical regions)

# Cooperation



Botanical Garden and Botanical Museum Berlin-Dahlem  
(Interface to GBIF Network – Global Biodiversity Information Facility)

Herbaria of Berlin, Halle, Gatersleben and Jena

University of Halle

University of Hamburg

Academy of Science of Mongolia

State University of Khovd, Mongolia

# Project funding

- FloraGREIF funded by the German Research Foundation (DFG): 3 years (2007 – 2010)
- Staff capacity of 3 x 50 %:  
½ IT Specialist, ½ Landscape Ecologist (Specialist for Mongolia), ½ Botanist

A close-up photograph of a plant stem, likely a legume, showing several young, green, pointed seed pods or flower structures. The surface of the stem and these structures is covered in a dense, light-colored, fuzzy hair-like texture. Some reddish-brown, more rigid hairs are also visible.

Thank you very much for your attention!

<http://floragreif.uni-greifswald.de>